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ABSTRACT

Former agricultural students from five Southern land-grant universities evaluated the relevance of curriculum competencies and skills to their careers. Using a 4-point scale, 291 respondents from 1862 institutions and 105 respondents from 1890 institutions rated 15 action competencies and 23 agricultural competencies. On action competencies, respondents rated oral communication skills as most needed and computer and statistical skills as least needed. Compared to the 1862 alumni, 1890 alumni gave higher ratings to all skills, and gave significantly higher ratings to written communications, project evaluation, public speaking, cost management, computer use, and basic statistical techniques. This may reflect a feeling by 1890 alumni that their precollege training in action competencies was insufficient, or it may reflect precollege expectations by 1862 alumni of more specialized curricula with less emphasis on basic action competencies. Among agricultural competencies, respondents rated knowledge and use of agricultural chemicals as most needed and awareness of the world food problem as lest needed. However, the highest need score for agricultural competencies was lower than the lowest need score for action competencies. Three animal science skills were the highest rated items for 1890 alumni and among the lowest-rated items for the 1862 alumni. The 1890 alumni also tended to give higher scores to broad general competencies such as awareness of the world food problem. These results may arise from the college major of the respondents and the presence of many foreign students among 1890 alumni. The report includes eight statistical tables and four references. (SV)

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EVALUATION OF CURRICULUM COMPETENCIES AND SKILLS BY LAND-GRANT UNIVERSITY ALUMNI

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EVALUATION OF CURRICULUM COMPETENCIES AND SKILLS BY LAND-GRANT UNIVERSITY ALUMNI

by

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ABSTRACT

Agricultural related career opportunities are about four times more prevalent than the number of graduates from land-grant universities each year (Coulter, !986). The more that is known about competencies needed in these careers and the more they are taken into account in curriculum development, the more competitive land -grant graduates could be. It is the purpose of this paper to determine which competencies or cluster of competencies former students find most essential to their careers. A second purpose is to determine if former agricultural students of 1890 and 1862 land-grant colleges find the same action competencies to be most essential to their careers. 1) Fifteen action competencies and 23 agricultural competencies have been evaluated by samples of former students (1977). As part of the Agricultural Career Regional Research Project (S-200) samples of five land-grant universities from Alabama and Tennessee are included. Descriptive statistics, factor analysis and T-tests for difference between means of the 1862 and 1890 land-grant alumni are presented.

PROCEDURE

Self-administered questionnaires used in this study were constructed by the S -200 regional research technical committee to evaluate "occupational career paths of former students in The Southern Land-Grant Universities". The questionnaire asks about students' educational attainment, career mobility, and their perspective on the appropriateness of their education.

The questionnaire with an explanatory cover letter and return self-addressed envelope was sent to former students from Alabama A & M University, Tennessee State University, Tuskegee University, Auburn University, and University of Tennessee who were involved in the earlier study of career orientations of students enrolled in agriculture and home economics during the spring of 1977. This initial study profiled aspirations and expectations of the new generation of agricultural students that enrolled in increasing number during the 1970's. In 1987, approximately ten years later, persons from the same sample were relocated and asked to complete a follow-up survey that collected information on their actual collegiate experiences, and their educational and occupational achievement in the intervening years. There were 41 respondents from Alabama A & M University , 99 from University of Tennessee, 17 from Tennessee State University, 194 from Auburn University and 51 from Tuskegee University.[1]

RESULTS

ACTION COMPETENCIES:

Former students were asked to rate 15 action competencies with respect to how much they needed to acquire them as a part of their college education. Five items pertained to communication and leadership skills, three items each to group organizational skill and to management skills and two each to personal organizational skills and quantitative analysis techniques. A four-point scale was used as follows: (1) not needed, (2) some what needed, (3) much needed, and (4) essential.

Average scores for all respondents (396) ranged from a low of 2.54 for "skills in basic statistical techniques" to a high of 3.51 for "skills in oral communication." Only 17 of 105 paired means were not significantly different at the .05 level (Table 1). The eight communication skills and group organizational skills were scored high, but they ranged widely and significantly from 2.91 to 3.51. Also within this range, scores for personal organizational skills - setting goals (3.22) and time management (3.27) - did not differ. Average need for the two quantitative analyses skills, computer and statistics, were scored significantly lower than all other skills. Next, average scores of three management skills - negotiating employee/employer differences (2.90); handling consumer/customer relations (2.80); and finances and cost management (2.87) - did not differ significantly among one another, but they were scored significantly lower (2.91) than all but one of the communication or organizational skills, public speaking.

1890 and 1862 Differences: Average scores of the 15 items for 1890 and 1862 land-grant alumni were highly correlated ($r = .93$). However, the 1862 alumni

TABLE 1: AVERAGE NEED SCORE FOR 13 ACTION COMPETENCIES BY ALUMNI OF 1890 AND 1862 LAND-GRANT INSTITUTIONS.[1]

ACTION COMPETENCIES	TOTAL MEAN SCORE[2] (N=396)	MEAN SCORE 1890 (N=105)	MEAN SCORE 1862 (N=291)	DIFFERENCE[3]
Skill in oral communication	3.51	3.57	3.49	0.08
Skill at using problem solving techniques	3.40	3.53	3.36	0.17
Skill in written communication	3.32	3.54	3.25	0.29**
Skill in motivating and managing others	3.31	3.42	3.27	0.15
Skills in personal time management	3.27	3.31	3.27	0.04
Skills in setting personal goal	3.22	3.35	3.18	0.17
Skill in setting organizational goals & objectives	3.20	3.37	3.15	0.22*
Skill in effective group leadership	3.12	3.24	3.07	0.17
Skill in project and/or program evaluation	2.97	3.17	2.90	0.27**
Skill in public speaking	2.91	3.19	2.81	0.38**
Skill in negotiating employee/employer differences	2.90	3.07	2.84	0.23
Skill in finance and cost management	2.87	3.08	2.80	0.28*
Skill in handling consumer/costomer relations	2.80	2.81	2.80	0.01
Skill in computer use	2.65	2.96	2.54	0.42**
Skill in basic statistical techniques	2.54	2.84	2.43	0.41**

1 Pearson Correlation(r) for 1890 and 1862 mean score is .93.

2 88 of 105 paired means (total) are significantly different at the .05 level.
As a rough rule-of-thumb, any difference of 0.1 between the paired means has a significant T-test at .05 level.

3 T-tests for differences between group means are significant at .05 level (*) and .01 level (**) respectively.

were more discriminating as their mean scores ranged from 2.43 to 3.59 compared with 2.81 to 3.57 for the 1890 alumni. 1890 alumni scores were significantly higher on six of 15 T-tests at the 0.01 level. Starting with the highest ranked skill they were written communication, project and/or program evaluation, public speaking, finance and cost management, computer use, and basic statistical techniques. Two additional averages were significantly greater at the .05 level. They were skills in setting organizational goals and negotiating employer/employee differences. While the remaining seven mean scores were not significantly different, it is noteworthy that the 1890 alumni scores were all higher. That is not likely to happen due to chance alone.

At least two underlying causes may help to explain the greater need expressed by 1890 alumni for these competencies, educational background prior to college and the level of specialization sought from a college education. First, 1890 land-grant students coming from predominately-black public high school systems may have been more likely to have felt that their pre-college training in these action competencies was insufficient to compete in the job market at levels desired. A second underlying cause for the differences may be that 1862 students may have come to college expecting more specialized curriculums and therefore ranked these basic action competencies some what lower. In addition to the lower average scores, the fact that the 1862 students were much more discriminating among the items supports the hypothesis that their expectations were more specialized.

AGRICULTURAL COMPETENCIES:

Regarding agricultural competencies, alumni were asked to rank 23 items in the same way as the action competencies. Included were eight Plant and Soil Science items, three Animal Science items, three Forestry items, and six Agricultural

TABLE 2: AVERAGE NEED SCORE FOR 23 AGRICULTURAL COMPETENCIES BY ALUMNI OF 1890 1890 & 1862 LAND-GRANT INSTITUTIONS.[1]

AGRICULTURAL COMPETENCIES	TOTAL MEAN SCORE[2] (N=396)	MEAN SCORE 1890 (N=105)	MEAN SCORE 1862 (N=291)	DIFFERENCE[3]
Knowledge of agricultural chemicals and their uses	2.30	2.41	2.26	0.15
Knowledge of plant nutrient requirements	2.23	2.30	2.21	0.09
Knowledge of environmental effects of water management on water quality	2.19	2.30	2.16	0.14
Knowledge of agricultural economics	2.16	2.28	2.11	0.17
Knowledge of distinctive characteristics of annual, biennial, and perennial plants	2.14	2.17	2.13	0.04
Knowledge of efficient production in agriculture	2.07	2.30	1.99	0.31*
Knowledge of micro-organism functions in soils	2.05	2.12	2.03	0.09
Ability to interpret and use soil test results	2.04	2.17	1.99	0.18
Knowledge of basic agricultural production systems	2.03	2.31	1.93	0.38**
Knowledge of economically important forest resources	1.96	2.01	1.95	0.06
Ability to evaluate agricultural investment alternatives	1.91	2.07	1.85	0.22
Knowledge of natural resource property rights	1.91	2.13	1.83	0.30*
Knowledge of agricultural mechanics	1.91	2.11	1.83	0.28*
Ability to calibrate planters and spraying equipment	1.88	1.93	1.86	0.07
Ability to identify major agronomic crops grown in U.S.	1.87	2.13	1.78	0.35**
Knowledge of livestock/poultry breed and charcteristics	1.86	2.37	1.68	0.69**
Knowledge of basic methods for controlling livestock/poultry diseases	1.84	2.34	1.66	0.68**
Ability to identify basic feed nutrient requirements for livestock and poultry	1.83	2.31	1.65	0.66**
Knowledge of landscape design and selection of plant materials	1.82	2.02	1.74	0.28*
Knowledge of U.S. agricultural policy	1.80	2.09	1.69	0.40**
Ability to set up farm record system	1.78	2.14	1.65	0.49**
Ability to estimate the quantity of forest products on a site	1.76	1.79	1.75	0.04
Awareness of world food problem	1.66	2.07	1.51	0.56**

1 Pearson Correlation(r) for 1890 and 1862 mean score is .34.

2 172 of 253 paired means (total score) are significantly different at the .05 level. As a rough rule-of-thumb, any differences of 0.10 (0.08) between the paired means has a significant T-test at .05 (0.01) level.

3 T-test for difference between group means are significant at .05 level (*) and .01 level (**) respectively.

Economics items. Three other items indicating a broad general agricultural base were included. They pertained to "awareness of the World food problem", "ability to identify major agronomic crops grown in the U.S.", and "knowledge of agricultural mechanics".

Average scores for alumni from all five institutions ranged from a low of 1.66 on "awareness of World food problem" to a high of 2.30 on "knowledge of agricultural chemicals and their use". As would be expected of a whole sample, the specialized competency need scores were lower but their standard deviations were higher than the general need scores. In fact, the highest agricultural competency need score (2.30) in Table 2 was lower than the lowest action competency score (2.54) in Table 1. The agricultural scores were also more tightly clustered within .64 points compared to a range of .97 for the 13 action competencies.

Thirteen of the 14 highest ranking competencies are either plant and soil science (6), forestry (2), or agricultural economics related (4). The 13th ranked item is "knowledge of agricultural mechanics." Only one each of the plant / soil science and forestry items ranked below the top 14 - "knowledge of landscape design/selection of plant materials" and "ability to estimate the quantity of forest products on a site." Both of these are technical, but narrower in specialization or application than the higher ranking competencies.

These rankings, most certainly reflect the preponderance of agronomy and forestry majors from Tennessee and Alabama land-grant institutions. Furthermore, those in animal sciences could hardly dismiss the importance of plant and soil science to success of their own professions. The three animal science scores, all below the median agricultural competency scores (1.91), were not significantly different from one another. While the majority of the economic items scored above the median, acknowledgment of the importance of economics to all agricultural specialists, these six items ranged from a low of 1.78 - "ability to set-up farm record

systems" - to 2.16 - "knowledge of agricultural economics". Similar to the agronomy and forestry items, the narrowest technical agricultural economic's item ranked at the bottom of the list.

Finally, broader theoretical competencies such as "awareness of World food problem", "ability to identify major agronomic crop grown in U.S.", and "knowledge of U.S. agricultural policy" all ranked among the least needed competencies. None -the-less, these are competencies reported as most essential by the higher paid alumni in the Kentucky sample. That analyses has not been done for this sample, however.

1890 and 1862 Differences: The Pearson correlation for 1862 and 1890 land-grants was a relatively low .34 for these 23 items. The major difference was in the scores accorded to the three animal science items. They were the three highest items for 1890 alumni and among the five lowest for 1862 alumni. The 1890 alumni also accorded significantly higher scores to the broad general competencies that ranked near the bottom of the total mean score list. Particularly notable is the .56 point difference for "awareness of World food problem". The relatively larger number of foreign students among 1890 alumni no doubt accounts for much of this difference. Similarly, the greater need for animal science skills could be logically explained. Domestic students at 1890 land-grant institutions may also be relatively more animal oriented due to the Veterinary Medicine program at Tuskegee University and the Food Science program at Alabama A&M University. The traditional emphasis on agribusiness education program at the 1890 institutions would also account for the higher scores attributed to the broader general competencies.

In sum, these agricultural competencies need scores can probably be fully explained by first, the current jobs and second, the college majors of the

respondents. More meaningful analysis of these scores can hopefully be done within majors across the entire regional sample.

Factor Analysis of Action Competencies: For 1862 and 1890 land-grant samples, separate factor analysis of the original Pearson product moment correlation matrix of the 15 action competencies produced ambiguous results. When two items dealing with personal skills were dropped, comparison of 13 items analysis for the two samples were much more straight forward.

Varimax rotations without iterations and with 1.0 remaining in the diagonals of the correlations matrix was used in this exploratory factor analysis. This retains all the original variation in the analysis as the four factors are rotated to redistribute the total variation across the four factors (Nie et. al, 1975). Four factors yielded Eigen values greater than one for both samples. For the 1890 sample, 71.7 percent of the variance was summarized by the four independent factors while for the 1862 sample 64.8 percent was captured by four similar factors. As observed in the previous T-tests analysis the 1890 scores were more highly clustered on the first factor 40.8% vs. 35.2% of the variances. (Table 3)

The five communication skills had the five largest loadings on the first factor of the 1862 alumni analysis and five of the seven largest loadings for the first factor of the 1890 analysis. (Table 4 and Table 5). The second factor on the 1862 matrix and the fourth factor on the 1890 matrix included the same three interpersonal and managerial skills as the most heavily loaded items. For the 1862 group skills in managing and motivating others loaded heavily on factor two given that factor a distinct interpersonal leadership style. The third factor on the 1862 matrix was very similar to the third factor on the 1890 matrix. The two highest loading were nearly identical: evaluation (.86 and .88) and setting goals (.74 and .79). The third items differed, but "effective group leadership" loaded moderately on the organizational

TABLE 3: EIGENVALUE FOR 13 ACTION COMPETENCIES OF 1890 AND 1862 LAND-GRANT INSTITUTION ALUMNI IN ALABAMA AND TENNESSEE

	1890 (N = 105)		1862 (N = 299)	
FACTOR	EIGENVALUE	PCT OF VAR.	EIGENVALUE	PCT OF VAR.
1	5.30	40.8	4.58	35.2
2	1.65	12.7	1.58	12.2
3	1.25	9.6	1.25	9.6
4	1.08	8.3	1.01	7.8
5	0.71	5.3	0.80	6.2
6 - 13		23.0		29.0

TABLE 4: VARIMAX ROTATED FACTOR MATRIX OF COLLEGE CURRICULUM ACTION COMPETENCIES: ALUMNI OF 1890 LAND-GRANT INSTITUTIONS IN ALABAMA AND TENNESSEE (N= 105)

ACTION COMPETENCIES	COMMUNICATION SKILLS	ANALYTICAL SKILLS (QUANTITATIVE)	ORGANIZATIONAL SKILLS (QUALITATIVE)	MANAGERIAL SKILLS
Skill in oral communication	**0.78**	0.36	0.21	0.01
Skill at using problem solving techniques	0.81	0.09	**0.19**	0.14
Skill in written communication	**0.78**	0.42	0.04	0.02
Skill in motivating and managing others	**0.72**	0.06	0.35	0.28
Skill in setting organizational goals & objectives	0.25	0.13	**0.79**	0.25
Skill in effective group leadership	**0.60**	0.22	0.55	0.12
Skill in project and/or program evaluation	0.12	0.23	**0.88**	0.07
Skill in public speaking	**0.43**	0.65	0.24	0.04
Skill in negotiating employee/employer differences	0.64	0.05	0.02	**0.49**
Skill in finance and cost management	0.19	0.36	0.06	**0.69**
Skill in handling consumer/costomer relations	0.09	0.12	0.11	**0.82**
Skill in computer use	0.00	**0.77**	0.01	0.18
Skill in basic statistical techniques	0.09	**0.78**	0.03	0.14

TABLE 5: VARIMAX ROTATED FACTOR MATRIX OF COLLEGE CURRICULUM ACTION COMPETENCIES: ALUMNI OF 1862 LAND-GRANT INSTITUTIONS IN ALABAMA AND TENNESSEE (N= 294)

ACTION COMPETENCIES	COMMUNICATION SKILLS	MANAGERIAL SKILLS	ORGANIZATIONAL SKILLS (QUALITATIVE)	ANALYTICAL SKILLS (QUANTITATIVE)
Skill in oral communication	**0.80**	0.17	0.22	0.10
Skill at using problem solving techniques	0.22	0.27	**0.55**	0.27
Skill in written communication	**0.75**	0.03	0.09	0.33
Skill in motivating and managing others	**0.53**	0.52	0.32	0.11
Skill in setting organizational goals & objectives	0.18	0.25	**0.74**	0.06
Skill in effective group leadership	**0.59**	0.32	0.42	0.03
Skill in project and/or program evaluation	0.13	0.04	**0.86**	0.21
Skill in public speaking	**0.76**	0.10	0.07	0.27
Skill in negotiating employee/employer differences	0.14	**0.74**	0.23	0.13
Skill in finance and cost management	0.00	**0.80**	0.03	0.14
Skill in handling consumer/costomer relations	0.16	**0.66**	0.16	0.11
Skill in computer use	0.13	0.07	0.02	**0.77**
Skill in basic statistical techniques	0.08	0.01	0.19	**0.80**

skills factor of both 1890 and 1862 factor matrices (.55 and .42). Finally, the fourth factor on the 1862 matrix was nearly identical to the second factor in the 1890 matrix with the two analytical skill items loading at almost the same levels: basic statistical techniques (.80 and .78) and computing use (.77 on both). For the 1890 group score factor, skills in public speaking and written communication also loaded heavily. This factor takes on a distinct authority leadership style.

The fact that these factor matrices are highly similar suggests that there is a high degree of agreement on the types of skill needed by college graduates in general. Given that the factors are quite distinct suggest that construction of the four subscales for further analysis would be useful. Questions as to whom communication skills or analytical skills are most important should be answered. Which skills are most important, for those who stop with a B.Sc. degree as opposed to those who continue their formal education? Who are the relatively few alumni that score skills in computer use and basic statistical techniques to be essential? Are there different paths to career advancement for 1890 and 1862 students? Do the former combine authority type leadership skills such as quantitative analytic skills with written communication and public speaking (Factor 2, Table 4) to build careers while 1862 alumni have more successfully combined persuasion type interpersonal leadership skills such as managerial skills with group leadership and motivational techniques (Factor 2, Table 5)?

Factor Analysis of Agricultural Competencies: As with the action competencies, the agricultural competencies for 1862 and 1890 alumni were factor analyzed separately. For the 1890 sample, three orthogonal factors summarized 77.3 percent of the variance while for the 1862 sample, four factors with eigen values greater than 1.0 summarized 72.0 percent of the variance of the 23 competencies .

All eight plant and soil science competencies loaded heavily on factor one of

TABLE 6: EIGENVALUE FOR 23 AGRICULTURAL COMPETENCIES OF 1890 & 1862 LAND-GRANT INSTITUTION ALUMNI IN ALABAMA AND TENNESSEE

	1890 (N = 105)		1862 (N = 299)	
FACTOR	EIGENVALUE	PCT OF VAR.	EIGENVALUE	PCT OF VAR.
1	14.45	62.8	10.35	45.0
2	2.14	9.3	3.27	14.2
3	1.20	5.2	1.91	8.3
4	0.94	4.1	1.03	4.5
5	0.64	2.8	0.88	3.8
6 -23		15.8		24.2

TABLE 7: VARIMAX ROTATED FACTOR MATRIX OF COLLEGE CURRICULUM AGRICULTURAL COMPETENCIES: ALUMNI OF 1890 LAND-GRANT INSTITUTIONS IN ALABAMA AND TENNESSEE (N= 105)

AGRICULTURAL COMPETENCIES	PLANT & SOIL SCIENCE	FORESTRY	ANIMAL SCIENCE
Knowledge of agricultural chemicals and their uses	**0.79**	0.32	0.29
Knowledge of plant nutrient requirements	**0.81**	0.24	0.33
Knowledge of environmental effects of water management on water quality	**0.63**	0.51	0.16
Knowledge of agricultural economics	**0.70**	**0.44**	**0.29**
Knowledge of distinctive characteristics of annual, biennial, and perennial plants	**0.81**	0.36	0.22
Knowledge of efficient production in agriculture	**0.78**	**0.30**	**0.40**
Knowledge of micro-organism functions in soils	**0.72**	0.43	0.29
Ability to interpret and use soil test results	**0.74**	0.52	0.11
Knowledge of basic agricultural production systems	**0.70**	**0.43**	**0.34**
Knowledge of economically important forest resources	0.31	**0.82**	0.15
Ability to evaluate agricultural investment alternatives	**0.37**	**0.57**	**0.40**
Knowledge of natural resource property rights	0.24	**0.83**	0.09
Knowledge of agricultural mechanics	0.61	0.58	0.24
Ability to calibrate planters and spraying equipment	**0.81**	0.27	0.22
Ability to identify major agronomic crops grown in U.S.	0.80	0.17	0.39
Knowledge of livestock/poultry breed and charcteristics	0.22	0.12	**0.92**
Knowledge of basic methods for controlling livestock/poultry diseases	0.26	0.09	**0.91**
Ability to identify basic feed nutrient requirements for livestock and poultry	0.26	0.12	**0.91**
Knowledge of landscape design and selection of plant materials	**0.57**	0.61	0.09
Knowledge of U.S. agricultural policy	**0.32**	**0.48**	**0.56**
Ability to set up farm record system	**0.55**	**0.42**	**0.49**
Ability to estimate the quantity of forest products on a site	0.36	**0.80**	0.15
Awareness of world food problem	0.31	0.45	0.48

TABLE 8: VARIMAX ROTATED FACTOR MATRIX OF COLLEGE CURRICULUM AGRICULTURAL COMPETENCIES AND SKILLS: ALUMNI OF 1862 LAND-GRANT INSTITUTIONS IN ALABAMA AND TENNESSEE (N = 291)

AGRICULTURAL COMPETENCIES	PLANT & SOIL SCIENCE	ANIMAL SCIENCE	AG. ECONOMICS	FORESTRY
Knowledge of agricultural chemicals and their uses	**0.76**	0.22	0.32	0.06
Knowledge of plant nutrient requirements	**0.84**	0.16	0.22	0.19
Knowledge of environmental effects of water management on water quality	**0.62**	0.22	0.17	0.45
Knowledge of agricultural economics	0.35	0.39	**0.59**	0.35
Knowledge of distinctive characteristics of annual, biennial, and perennial plants	**0.79**	0.19	0.09	0.24
Knowledge of efficient production in agriculture	0.42	0.45	**0.64**	0.09
Knowledge of micro-organism functions in soils	**0.82**	0.15	0.14	0.22
Ability to interpret and use soil test results	**0.81**	0.14	0.30	0.14
Knowledge of basic agricultural production systems	0.48	0.43	**0.61**	0.00
Knowledge of economically important forest resources	0.18	0.07	0.16	**0.88**
Ability to evaluate agricultural investment alternatives	0.18	0.25	**0.69**	0.45
Knowledge of natural resource property rights	0.23	0.17	0.19	**0.70**
Knowledge of agricultural mechanics	0.43	0.19	0.64	0.11
Ability to calibrate planters and spraying equipment	**0.71**	0.05	0.49	0.00
Ability to identify major agronomic crops grown in U.S.	0.44	0.64	0.28	0.06
Knowledge of livestock/poultry breed and characteristics	0.08	**0.90**	0.14	0.04
Knowledge of basic methods for controlling livestock/poultry diseases	0.07	**0.91**	0.08	0.05
Ability to identify basic feed nutrient requirements for livestock and poultry	0.06	**0.91**	0.13	0.03
Knowledge of landscape design and selection of plant materials	**0.68**	0.06	0.16	0.04
Knowledge of U.S. agricultural policy	0.16	0.57	**0.41**	0.17
Ability to set up farm record system	0.20	0.54	**0.59**	0.09
Ability to estimate the quantity of forest products on a site	0.11	0.13	0.04	**0.89**
Awareness of world food problem	0.11	0.53	0.24	0.07

both matrices, but on the 1890 matrix factor one also included moderate to heavy loadings for several of the agricultural economics competencies.

Similarly the animal science and forestry factors on both scales included heavy loadings for their respective competencies plus, for the 1890 matrix, at least moderate loadings from the agricultural economic competencies and the remaining broader more general items.

The lack of a fourth factor for the 1890 matrix to uniquely represent agriculture economics is somewhat arbitrary. A fourth factor could have been forced even though its eigen value would have been less than 1.0 (0.94). However, the three factors sharing the agricultural economic competencies almost equally for 1890 alumni may represent a qualitative difference in the 1890 and 1862 program and career paths of alumni. First of all there are no agricultural economic programs at the master degree level for 1890 land-grant institutions in Tennessee or Alabama. Agricultural Economics instruction is offered through Agribusiness Education Departments.

In summary, it should be emphasized that this analysis addresses the need for selected action competencies and agricultural competencies in land-grant college curriculums as judged by 1977 alumni. More useful analysis of the career specific analysis of the S-200 region-wide data should be of more specific interest to the various disciplines. The limited sample does show data to be consistent and of generally good quality.

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REFERENCES

Almero, Maria Cristina P., and William F. Kenkel
1988 Salary Differentials between Male and Female Graduates of the University of Kentucky. Paper prepared for presentation at the annual meeting of the Southern Rural Sociological Association, New Orleans.

Coulter, Jane et. al.,
1986 Employment Opportunities For College ©Graduates in The Food and Agricultural Sciences. U.S. Department of Agriculture, Higher Education Programs.

Nie, Norman H. et. al.,
1975 Statistical Package For The Social Sciences; Mcgraw Hill, New York.
Ritsos, Pantelis B. et. al.,

1985 Professional Competencies Needed by Extension Employees in Urban Counties of Ohio. Summary of Research #43. Ohio State University Dept of Agricultural Education.